

reappearance during the recovery period. It is on this account that the "canthal" tear is so valuable, for it indicates that the corneal reflex is (or should be) present, and that the amount of anæsthetic is as small as is compatible with a successful anæsthesia. If, then, we administer our anæsthetic in quantities just calculated to abolish the lacrymal secretion, and then wait, if at any time in doubt, until the secretion again appears, we may feel confident that we are well on the safe side of the border-line between deep surgical anæsthesia and an overdose.

In the administration of anæsthetics there is no golden rule, and the utmost care must be taken to follow the general principles. In all the cases in which the behaviour of the lacrymal glands was observed, the greatest care was exercised in securing an unobstructed airway, an unembarrassed respiratory movement, and a position of the patient compatible with an adequate supply of blood to the higher centres.

The exhibition of such drugs as morphia, hyoscine, and atropine in a large number of cases completely abolishes the lacrymal secretion; also there are individuals, usually children between the ages of 5 and 15, in whom the lacrymal glands appear unaffected by the narcotics, and who, while under the influence of chloroform, show no evidence of lacrymal gland activity. In these rare cases the absence of the secretion is evident during induction, and this sign is therefore subsequently neglected.

Impending Vomiting and Overdose.

The importance of the presence or absence of the lacrymal secretion in differentiating the dilated pupil of overdose from that of impending vomiting is apparent. Those who affirm that it is possible to elicit a corneal reflex when the dilated pupil of "impending" vomiting is present, will consider no further differentiation necessary. Those who agree with me that only in the dilated pupil of "immediate" vomiting is it possible to obtain such a reflex, will admit the value of a further test.

The condition of the pupils in impending vomiting and in overdose is very similar; both may be inactive to light, neither retains a corneal reflex as a rule, and the accompanying signs and symptoms may give but little assistance. In such cases the value of the canthal pools is evident. If the canthi have been kept dry up to the moment at which the pupils commence to dilate, and if they remain dry after the pupils are dilated, then the anæsthetic must be withheld and preparations made for treating a condition of relative or absolute overdose. But if the canthi are flooded with tears, then the anæsthetist should at once increase the anæsthetic in order to inhibit the vomiting reflex and to secure an adequate anæsthesia.

If the canthi have not been dried after the stage of surgical anæsthesia has been established, and, if the anæsthetist has to rely on the appearance of the corneal reflex, &c., to dispel his doubts, then vomiting will often result, for the corneal reflex appears to be inhibited in some way during the initial period of impending vomiting and reappears (if it does reappear) in the shorter period of immediate vomiting, when it is too late to prevent the onset of vomiting by increasing the anæsthetic.

The Value of the Sign.

Those who are experienced in the administration of anæsthetics, and who subconsciously observe every little detail during an administration, will affirm that at no stage should the administrator be in doubt as to the depth of narcosis; nevertheless, an easily remembered and reliable indication of the depth of narcosis is valuable.

In the course of the investigations undertaken to establish the reliability of the lacrymal activity as a means of regulating the amount of the narcotic employed over 200 cases were anæsthetised for operations varying in severity from the opening of a superficial abscess to the resection of several inches of intestine, but owing to lack of space details have been omitted. Naturally many slight variations were observed in different cases, but they were of no practical importance, and may be divided into variations (1) in the quantity of the secretion and (2) in the time at which the secretion appeared and disappeared relative to the presence or absence of the corneal reflex. The latter has already been discussed, and I will now report on the former variation.

When chloroform is administered alone the quantity of the lacrymal secretion is usually small, but in uncomplicated cases it is at once evident. During the administration of

ether the lacrymal secretion is abundant, and in giving mixtures containing ether the secretion does not fall much below that when ether is given alone.

In conclusion, I would insist: (1) That the appearance of a lacrymal secretion during anæsthesia is a constant phenomenon; (2) that it bears a definite relation to the depth of narcosis; and (3) that, since the exceptions to the general rule are easily recognised, the value of this sign must be at once apparent.

RECTAL ETHER ANÆSTHESIA.

OBSERVATIONS FROM ONE HUNDRED CASES.

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HAVING completed 100 cases of anæsthesia by the rectal ether method, the results seem sufficiently interesting to record. Although my personal administrations are 100, something like 450 have been given throughout the Queen's Hospital during the last 18 months. I am here dealing entirely with soldiers in more or less good physical condition, and have not been able to apply this experience to patients in poor physical condition or to women or children. Also the types of operation were entirely associated with facial work, such as plastic operations on the skin, rhinoplasty—with or without the removal of a rib cartilage—mandibular bone grafts, and plastic operations on the eye. Still, I feel that this form of anæsthesia could be, and doubtless is being, adapted to certain operations in civil practice, such as for tumours or removal of the thyroid gland, extensive glands of the neck, mastoid operations, nerve sutures, bone grafts, and breast operations.

Owing to various war conditions the most perfect procedure has been impossible; thus we may expect still better results. These difficulties arose owing to (1) the shortness of preparation, sometimes not even 12 hours; (2) the difficulty of obtaining the necessary tranquillity after the preliminary injection of morphia and atropine; (3) the inferior quality of some samples of ether; (4) the necessary substitution of pea-nut oil for pure olive oil; and (5) the inferior quality of the atropine.

The Technique.

(a) *Preparation.*—A dose of castor oil is given two nights before the day of operation, and an enema on the morning following. During the day preceding operation the diet should be light and the patient kept in bed. Six hours before the morphia and atropine injection is given the rectum should be washed out by catheter and funnel until the bowel is clean, saline solution being used. One-and-a-half hours before the time of operation an intramuscular injection is given of morphia gr. $\frac{1}{4}$ and atropine gr. 1/50. This should be given when the patient is on the bed, trolley, or table on which he is to be anæsthetised. He should then have perfect tranquillity in a shaded room for the next half-hour, lying, if possible, on his left side.

(b) *Induction.*—The patient lies on the left side with the knees drawn up. A vaselined catheter (size No. 12 to 16) is passed into the rectum 4 to 5 inches, not more. This is joined up to a tube and funnel by a glass connexion. The following mixture is placed in a glass measure and is stood in a basin of very hot water:—Olive oil, 2 oz.; ether, 5 to 6 oz.; either paraldehyde, 2 dr., or chloretone, 30 gr. Before actually introducing the mixture it is most important to explain to the patient what is going to be done, and particularly to impress upon him the necessity of saying immediately when there is the slightest desire to evacuate. Introduce the mixture very slowly, and on the slightest intimation from the patient that there is abdominal "pinching" with the desire to evacuate, stop the flow by compressing the catheter until the patient again intimates that the feeling has passed. When all the mixture is introduced clamp the catheter and leave it in the rectum.

The patient's head is next covered with a towel to encourage induction by means of re-breathing, and he is watched until asleep or unconscious. In most cases it will not be wanted, but occasionally it will be found necessary to produce a free airway. In from a half to one hour induction should be complete, but in certain cases a small quantity of ether or C.E. mixture on a mask is needed to complete it.

(D) Morph. c. atropine. Olive oil c. ether 5-6 oz. c. chloretone 25 gr.

The *recumbent position* was usual, and only rarely was there any desire to sit up. Some were tranquil throughout, others had a sense of impending death, which was nearly always justified. *Cyanosis* was a frequent and marked feature; it was often a better index of the extent of pulmonary disease than the physical signs, and was of great prognostic value. In the early stages and often during the long convalescence it was of lighter hue, the cheeks might be flushed, whilst the ears were deeply cyanosed; later it became more intense and general, and still later produced a dusky black complexion. It was evidently symptomatic of